Remarks

Please cancel claims 6-9, 11-14, 17, 18 and 21.

Claims 15, 16, 19 and 20 have previously been cancelled.

Please amend claims 1-5 and 10.

Please add claims 22, 23.

Claims 1-5, 10, 22 and 23 are presented for consideration by the Examiner.

The invention is directed to a conductive duel component yarn with the first component comprising solely a single polymeric material, and the second component comprising solely a single polymeric material blended with carbon nanotubes.

The first component is preferably set subsequent to extrusion, providing yarn stability. The second component is adhered to the first component in unset condition forming preferably a sheath along its length. The sheath comprises preferably between .5% wt to 10% wt of the multi-component yarn, while the nanotubes form between .5% to 10% of the blend forming the sheath. The result is a stable, flexible, high strength, conductive composite yarn which is not subject to flaking or separation of components.

The claims, 1-4, 6, 9-10, are rejected under 35 USC 103(a) as unpatentable over Iguro, et al (Iguro), in view of Patel, et al (Patel), and claims 1-12 are rejected under 35 USC 103(a) as unpatentable over Hodan (Hodan) in view of Patel.

The rejection states the reference Iguro teaches a sheath/core conductive fiber with the primary component comprising an elongated filament of polymeric material and the secondary component a blend of polymeric material and carbon bonded with the primary component along its length. The carbon material is said to be present in

amount of 10-50% by weight. Also, the secondary component may comprise between 15% to 50% of the yarn. The rejection notes that Iguro does not teach carbon nanotubes.

The Iguro patent is directed to a conductive composite fiber which is composed of a core formed of a fiber forming polymer and a sheath formed of a fiber forming polymer containing carbon black. The two components are melt spun simultaneously through a single orifice. The multi-component yarn is drawn and set after spinning. The % carbon disclosed in the sheath component is 10-50%. The lowest % carbon set forth in the fourteen samples is 23%.

The rejection states that Hodan teaches multi-component fibers comprising a primary component of an elongated filament and a secondary component that is a blend of polymeric material and carbon. The components are configured into a sheath core combination. The rejection states the fibers of Hodan are coated with the secondary component which is an electrically conductive coating containing carbon black. It is stated the coating takes place during fiber manufacturing or as a separate step. The reference teaches the primary component is set prior to bonding.

Hodan is also said to teach the presence of carbon black in amounts as low as 2% but fails to teach the use of carbon nanotubes.

Hodan is directed to an electrically conductive fiber made of a multi-component filament having a suffusive component and an impervious component. A suffusion coating solution which includes conductive particles is provided. The coating is applied to the multi-component filament where it suffuses onto a surface of the suffusive

component to render an electrical resistance to the filament. The coating consist of carbon black, formic acid and acidic acid.

The rejection states that Patel teaches conductive polymeric composition comprising polymeric resins and electrically conductive filler materials. The filler materials may be carbon black or carbon nanotubes. The carbon nanotubes are stated as usable in amounts less than or equal to 30% wt, and preferably, less than or equal to 5% wt.

Patel is directed to a conductive polymeric resin which are commonly utilized in packaging materials, chip carriers, printers and photocopier components. The summary describes the invention as a composition which comprises a polymeric resin, an electrically conductive filler and an antistatic agent. The various examples disclose the composition as usable in processes such as injection molding and blow molding.

The conductive composition is disclosed in Table I as a polymeric resin combined with only an antistatic agent, only chopped carbon fibers and primarily with both. In no case is less than 15% carbon fiber utilized. In Table 2, the average residual voltage and the standard deviation is measured. It is stated that the criteria providing for both low standard deviation and a low average reading is met only when carbon fibers and an antistatic agent are present. (See column 2, lines 29-43)

Finally, all claims are directed to a composition which includes a polymeric resin, an electrically conductive filler or carbon fiber and an antistatic agent.

No disclosure is directed to a composite yarn and no disclosure is directed to a carbon nanotube as an element of a multi-component fiber.

The rejection is to combine the teachings of Iguro or Hodan with those of Patel would render obvious the invention as claimed.

This rejection is respectfully traversed.

Turning now to the claims, the claim language defining the claims over the references of the rejection will now be pointed to as required by 37 CFR 1.111(b).

Claim 1 calls for a multi-component conductive yarn comprising a primary component formed of set elongate filament formed of a single polymeric material and a secondary component formed of said single polymeric material and carbon nanotubes, bonded with the primary component; the second component being unset.

Iguro fails to teach this structure since both the fiber and sheath are extruded through a single spinneret requiring that both components are either set or not set.

Hodan discloses a multi-component fiber in which one component is suffusive and the other is impervious. The fiber is formed and coated with a suffusion coating causing conductive particles to suffuse onto the suffusive component. Hodan does not disclose a dual component yarn as set forth in the claim. Hodan does not disclose a blend comprising a polymeric material and carbon nanotubes.

Claim 1 calls for the secondary component to consist solely of a blend of the single polymeric material and carbon nanotubes bonded with the primary component along its length with the secondary components being unset. Iguro does not teach this structure as both components are either set or not set. Hodan does not teach this structure as it consists of first and second components which are coated with a conductive solution. Neither reference teaches the use of carbon nanotubes.

The claim calls for the carbon nanotubes to constitute between .5%-15% of the multi-component yarn. Hodan does not teach this composition as it does not disclose carbon nanotubes and discloses only utilizing carbon in a coating solution applied to a composite fiber. Iguro does not teach the use of carbon nanotubes and does not teach carbon nanotubes comprising about .5% of the multi-component yarn. Patel teaches only a conductive polymeric resin which may include carbon nanotubes and is efficient only when it also includes an anti-static agent.

Claims 2, 3, 4, 5, and 10 depend from claim 1 and are thought to be allowable for the set forth reasons.

Claim 22 also calls for a multi-component yarn comprising a primary and a secondary component with the primary component consisting of a single polymeric material unset and blended with carbon nanotubes, the carbon nanotubes comprising between .5% and 10% of said blend and said polymeric material comprising between 90% to 99.5% of said blend.

No patent of the rejection discloses a component of a multi-component yarn limited to the claimed compositions.

Claim 23 depends from claim 22 and is thought to be allowable for the stated reasons.

The rejection of the claims under 35 USC 103(a) as unpatentable over Iguro or Hodan in view of Patel is further traversed as improper.

The primary references are directed to a multi-component fiber, the secondary reference to a composition. The claims are directed to a multi-component yarn.

The secondary reference is directed to a solution, primarily for forming molded articles. There is no teaching nor suggestion that the solution of Patel could be combined with a preformed polymeric fiber to form a multi-component conductive yarn.

For the above set forth reasons, it is urged that the Examiner find the claims to be allowable and pass the case to issue in the due course of PTO business.

If the Examiner feels a personal interview would be productive, it is respectfully noted that Applicant's Representative is most ready to accommodate.

Respectfully submitted,

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The Stamp of the PTO hereon acknowledges receipt of the following: Transmittal Letter; Response Under 37 CFR 1.112 to the PTO Action of 4/20/2005; and Return Receipt Postcard.
Re: Julian S. Crawford, et al
SN: 10/767,668
For: CONDUCTIVE FILAMENT
Docket No.: 033583.00007
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